INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)

Thirty-third Session of the Assembly
UNESCO, 25 June–3 July 2025

Item **3.4.3** of the Provisional Agenda

OUTLINE OF THE IOC DATA ARCHITECTURE CONCEPT PROPOSAL

Summary

The document briefly outlines the concept of an IOC Data Architecture proposed to optimise connections between existing IOC elements that would strengthen delivery of ocean data for multiple services and applications. The IOC Data Architecture Concept Proposal (IOC/INF-1550) contains details on this architecture and how the unique IOC set of assets will connect and integrate to deliver something much more powerful than the sum of its parts. The Assembly is being asked to approve the IOC Data Architecture concept and Terms of Reference for the Working Group on the development of the IOC Data Architecture, which are annexed to the proposed decision under this item.

Financial and administrative implications: paragraph 12.

The proposed decision is referenced A-33/Dec.3.4.3 in the Action Paper (document IOC/A-33/2 Prov.)

Background and introduction

1.   The _Global Ocean Observing System 2030 Strategy_ (Decision IOC-XXX/7.1.1) identified Data as Strategic Objective 7 with the aim to '_ensure GOOS ocean observing data and information are FAIR with appropriate quality and latency_', with key outcomes around open data access and products based on essential ocean variables (EOVs). The IOC Assembly at its 31st session (2021), through Annex II to Decision A-31/3.4.2, established the IOC Ocean Data and Information System Project (ODIS), and the IOC Executive Council at its 57th session (2024) requested GOOS to provide a proposal to the IOC Assembly to evolve GOOS (EC-57/4.1), including to '_create a functioning Digital Ecosystem to enable end-user applications_' as one of five key elements of this work.

2.   The different programmes of IOC are collecting, managing, analysing, and delivering ocean data, services, information and knowledge, based on ocean. The IOC has embraced and adopted the FAIR data principles and the _IOC Data Policy and Terms of Use (2023)_, but to date have not had an collective internal vision for a data backbone. Society—government, commercial, science and others, have a growing need for ocean data to inform decision making, and at the same time the digital information revolution means that they expect to be able to access this data easily and seamlessly. The IOC Data Architecture Concept Proposal (IOC/INF-1550) contains details on the data architecture schema and the IOC unique set of assets that the IOC is proposing to connect up to deliver a digital ecosystem that is much more powerful than the sum of its parts.

3.   In recent years GOOS, IODE, and in dialogue with WMO, have been aligning their developments around broad adoption of open architectures and federated system approach (ODIS, WIS2.0, ERDDAP™), several key IOC data systems are now ready to be robustly interlinked.

4.   The First IODE/GOOS Data Workshop was held at the IOC Project Office for IODE between 30 September and 2 October 2024. It focused on enhancing collaboration between the International Oceanographic Data and Information Exchange (IODE) and the Global Ocean Observing System (GOOS). The goal was to enhance coordination and discuss an integrated and scalable IOC digital architecture that would improve data sharing, management, and accessibility, across ocean systems, and enhance the IOC's support to key United Nations mandates. The meeting was attended by experts from the different elements of GOOS and IODE, as well from IOC Ocean Science Section and Tsunami Resilient Section, and experts from relevant elements of the Ocean Decade structure. The report of the meeting is available as IOC Workshop Reports, 311.

5.   Key objectives of the workshop were to: (i) identify roles and synergies: clarifying the mandates, responsibilities, and connections between GOOS and IODE, for all Essential Ocean Variables (EOVs); (ii) develop a joint vision for an IOC Data Architecture: establishing a co-evolved, integrated, FAIR and CARE aligned, IOC data architecture to support the ocean digital ecosystem; (iii) technical foundation: developing the technical architecture for a unified IOC Data space to be presented at the IOC Assembly in 2025; (iv) coordination: define coordination between GOOS, IODE and other IOC programmes to evolve and mature the IOC Data Architecture; and (v) future planning: outlining next steps (short- and long-term) for meeting future user needs.

6.   The workshop formed a watershed moment for cross-IOC coordination on data issues, developing a vision for data across the value chain of IOC activities and for the unique role that IOC can play in the digital ecosystem. The key outcomes were: (i) an agreement on a draft basic schema for the IOC Data Architecture, linking key IOC components into a holistic ecosystem that would provide a joint vision for an IOC Data Architecture; (ii) to develop a proposal for the IOC Data Architecture that can be presented to the IOC Assembly at its 33rd session in 2025; and (iii) to establish an 'IOC Data Architecture Working Group' to write a proposal for a cross-IOC data architecture/space, with Terms of Reference as noted in IOC Workshop Reports, 311.

7.   The IOC Data Architecture will adopt a data fabric architectural model, closely resembling that recommended by the _Implementation Plan of the UN Decade of Ocean Science for Sustainable Development_. Each layer of the fabric, and the data exchanges that stitch them together, must have

well-developed data management practices in place to ensure quality and integrity. Many elements of the proposed IOC Data Architecture already exist, and the workshop outlined an approach to optimise connections between the existing IOC elements that would strengthen delivery of ocean data for ocean data and information services.

8.   In a relatively simple manner and using existing assets and advanced technology, this creates an integrated IOC 'data system' that can simplify IOCs work moving forward and underpin data availability in a very real sense. It will supercharge the production of data knowledge products, including Essential Ocean Variable (EOV)/Essential Climate Variable (ECV) data products, SDG indicators, and global data exchange diagnostics and reports, and will be a powerful platform for the future, enabling complex and compound products, digital twins and AI applications not yet fully understood. Overall, it will cement IOCs leading role as setting global ocean information system standards and being a hub for ocean data; expanded use of ocean data will support funding for the core IOC infrastructure elements.

9.   IOC has a unique role in the ocean community as the global coordinator, specifically of ocean science, observations and data, it also has the mechanisms to globally consult ocean, data, and other communities to get the implementation right. Finally, IOC has the people, expertise and capacity to deliver a system for the benefit of society.

10.   Following the workshop, an interim Working Group on the development of the IOC Data Architecture was established and developed the IOC Data Architecture Concept Proposal proposed in IOC information document 1550. The next steps in developing the IOC Data Architecture are as follows:

   (i)   Consult with a range of stakeholders on the proposal concept and integrate the feedback into a revised document.

   (ii)   Develop a detailed implementation plan for Phase 1 of an IOC data architecture to be submitted to the IOC Executive Council at its 59th session in 2026.

   (iii) Develop a limited set of minimal viable product demonstrators[1], that are feasible for implementation within a year and that will demonstrate the value of an integrated IOC Data Architecture to IOC Executive Council in June 2026.

   (iv)   Communicate with, and seek feedback from, stakeholders—including Member States, on the implementation plan for an IOC data architecture prior to the 59th session of the IOC Executive Council.

11.   The Assembly is being asked to approve the IOC Data Architecture concept and Terms of Reference for the Working Group on the development of the IOC Data Architecture, such that it can continue its work as outlined above.

Financial and administrative implications

12.   This has no immediate financial and administrative impact. The next steps will be developed within the existing parameters of the regular budget of IOC (42 C/5), including the development of the minimum viable product demonstrators, primarily supported by GOOS and IODE. The detailed implementation plan for Phase 1 of an IOC data architecture, which will be prepared for the 59th session of the IOC Executive Council in June 2026, will include resource implications for future developments.

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[1] A minimum viable product (MVP) is a version of a product with just enough features to be usable by early customers who can then provide feedback for future developments. In this case the MVPs would demonstrate the benefits to the ocean community and IOC elements of connecting the data elements and service provision aims in the framework of the proposed IOC Data Architecture.